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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/014,899	12/14/2001	Loic Brunel	217148US2	4199

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EXAMINER	
ANGELO, CAROLINE J	

ART UNIT	PAPER NUMBER
2637	

DATE MAILED: 03/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/014,899	BRUNEL, LOIC	
	Examiner	Art Unit	
	Caroline Angelo	2637	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/12/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schnell et al. ("Diversity Considerations for MC-CDMA Systems in Mobile Communications," IEEE, 1996, pp. 131-135) in view of Chun et al. (US 6,798,758 B1) and further in view of Ramberg et al. (US 2001/0050948 A1).

4. Schnell discloses a method of detecting a plurality of symbols transmitted by or for a plurality of K users (page 131, column 2, paragraph 4), the said method comprising a filtering step adapted for supplying a complex vector characteristic of said received signal (page 135, column 1) and in that at least the closest neighbors of the vector is sought within a lattice of points, the transmitted

symbols being estimated from the components of the closest neighbors (page 135, column 1).

5. However, Schnell is silent about decomposing the complex vector into first and second vectors, and about the symbols belonging to a modulation constellation from which a search lattice is formed.

8. In the same field of endeavor, however, Chun discloses a method wherein a complex vector is decomposed into a first vector and a second vector (column 6, lines 29-35).

1. It would have been obvious to one having ordinary skill in the art at the time of the invention to use a first a second vector as disclosed by Chun in the spread sequence method of Schnell because Chun provides Schnell with a simpler CDMA system.

2. In the same field of endeavor, Ramberg discloses a system wherein each symbol belongs to a modulation constellation and is the subject of a spectral spreading by means of a spreading sequence (page 2, paragraph 23).

3. It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize symbols from a modulation constellation as taught by Ramberg in the detection method of Schnell because modulation constellations are common in reception methods.

4. Regarding claim 15, claim 15 is an apparatus claim corresponding to method claim 1, and therefore is similarly analyzed as claim 1 above.

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schnell in view of Chun and Ramberg, and further in view of Dunn et al. (US 4,761,796).

6. Regarding claim 2, Schnell is silent about including a spreading sequence consisting of real multiplies of a complex coefficient.

7. In the same field of endeavor, however, Dunn discloses a detection method wherein the spreading sequences consist of real multiplies of the same complex coefficient (column 17, lines 58-63).

8. It would have been obvious to one having ordinary skill in the art at the time of the invention to use real multiples of the same complex coefficient as disclosed by Dunn in the spread sequence method disclosed by Schnell because real multiples are required for the matched filter.

9. Claims 3-5, 13, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schnell in view of Chun and Ramberg, and further in view of Brunel et al. ("Euclidean Space Lattice Decoding for Joint Detection in CDMA Systems," IEEE, 1999, p. 129).

10. Regarding claim 3, Schnell is silent about limiting the search to zones around the first and second vectors.

11. In the same field of endeavor, however, Brunel discloses a detection method wherein the search is limited to a set of points in the lattice belonging to a predetermined zone around the vector (page 129, column 1, paragraph 3).

12. It would have been obvious to one having ordinary skill in the art at the time of the invention to limit the search as disclosed by Brunel in the detection

method of Schnell because Brunel provides decoding complexity which does not depend on the modulation size.

13. As to claim 4, Schnell is silent about limiting the search to zones around the origin.

14. In the same field of endeavor, however, Brunel discloses a detection method wherein the search is limited to a set of points in the lattice belonging to a predetermined zone around the origin (page 129, column 1, paragraph 3).

15. It would have been obvious to one having ordinary skill in the art at the time of the invention to limit the search as disclosed by Brunel in the detection method of Schnell because Brunel provides decoding complexity which does not depend on the modulation size.

16. As to claim 13, Schnell is silent about the dimension of the lattice when the symbols are being transmitted synchronously.

49. In the same field of endeavor, however, Brunel discloses a detection method wherein, the symbols of said *K* users being transmitted synchronously, said lattice of points is of dimension *K* (page 129, column 1, paragraph 2).

50. It would have been obvious to one having ordinary skill in the art at the time of the invention to utilize a *K*-dimensional lattice with synchronous transmission, as disclosed by Brunel, in the detection method of Schnell because it allows the use of an efficient decoding algorithm.

17. As to claim 16, Schnell is silent about a DS-CDMA receiver comprising the detection device.

58. In the same field of endeavor, however, Brunel discloses a detection method which is suitable in a receiver for a DS-CDMA mobile telecommunication system (page 129, column 1, abstract).

59. It would have been obvious at the time of the invention to one having ordinary skill in the art to use a DS-CDMA receiver as taught by Brunel with the device disclosed by Schnell because Brunel receives the symbols which the device is designed to detect.

18. As to claim 5, Schnell is silent about spherical zones.

19. In the same field of endeavor, however, Brunel discloses a detection method wherein said first and second predetermined zones are spherical (page 129, column 1, paragraph 3).

24. It would have been obvious to one having ordinary skill in the art at the time of the invention to utilize spherical searching zones as taught by Brunel in the detection method of Schnell because it allows the use of an efficient ML lattice decoding algorithm.

25. Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schnell in view of Chun and Ramberg, and further in view of Viterbo et al. ("A Universal Lattice Code Decoder for fading Channels," IEEE, 1999, pp. 1639-1642).

26. Regarding claim 6, Schnell is silent about limiting the search with lower and upper bounds.

27. In the same field of endeavor, however, Viterbo discloses a detection method wherien the search for the closest neighbor of the vector is effected on a

plurality of components thereof, the search being limited for each of said components to an interval defined for a lower bound and an upper bound (page 1641, column 1, paragraph 3), said bounds being chosen so that said interval does not comprise points relating to symbols which cannot belong to the modulation constellation.

28. It would have been obvious to one of ordinary skill in the art at the time of the invention to use lower and upper bounds as taught by Viterbo in the closest neighbor search of the method disclosed by Schnell because Viterbo increases efficiency by eliminating impossible points from the search.

29. Claim 7 recites the same limitations as claim 6, and therefore is similarly analyzed as claim 6 above.

30. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schnell in view of Chun and Ramberg, and further in view of Lupas et al. ("Linear Multiuser Detectors for Synchronous Code-Division Multiple-Access Channels," IEEE, 1989, pp. 123-136).

31. Regarding claim 8, Schnell is silent about matrix processing of the vector prior to searching.

32. In the same field of endeavor, however, Lupas discloses a detection method wherein, prior to the search for the closest neighbor, the vector is subject to a matrix processing aimed at substantially decorrelating the different noise components thereof (page 126, column 2, section III).

33. It would have been obvious to one of ordinary skill in the art at the time of the invention to include matrix processing as taught by Lupas in the detection

method of Schnell because Lupas removes noise components and provides more accurate detection.

34. Claim 9 recites the same limitations as claim 8, and therefore is similarly analyzed as claim 8 above.

35. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schnell in view of Chun and Ramberg, and further in view of Adoul et al. ("Nearest Neighbor Algorithm for Spherical Codes from the Leech Lattice," IEEE, 1988, pp. 1188-1202).

36. Regarding claim 10, Schnell is silent about searching for points neighboring the vectors and estimating the transmitted symbols based on distances separating the vectors from the neighboring points.

37. In the same field of endeavor, however, Adoul discloses a detection method wherein the search step is extended to the search for a first set of points which are the closest neighbors of said first vector, referred to as first neighbors, and a second set of points which are closest to said second vector, referred to as second neighbors, and that the transmitted symbols are estimated flexibly from symbols generating the said first and second neighbors and distances separating said first neighbors from the first vector on the one hand and said second neighbors from said second vector on the other hand (page 1192, column 2, section III).

38. It would have been obvious to one of ordinary skill in the art at the time of the invention to include a search for closest neighbors as taught by Adoul in the

detection method of Schnell because Adoul provides a more systematic search method.

39. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schnell in view of Chun and Ramberg, and further in view of Mottier (US 2002/0072336 A1).

40. Regarding claim 11, Schnell is silent about eliminating already determined symbols at the output of the filter to estimate the symbol currently being received.

41. In the same field of endeavor, however, Mottier discloses a detection method wherein the contributions of each user to the signals obtained by the adapted filtering step are determined from the estimated symbols and that, for a given user *k*, the contributions of other users corresponding to the symbols already estimated are eliminated (figure 2, element 240 and page 1, paragraph 8) at the output of the filtering step (figure 2, element 230 and page 1, paragraph 8).

42. It would have been obvious to one of ordinary skill of the art at the time of the invention to eliminate the contributions of other users as taught by Mottier in the detection method of Schnell because Mottier eliminates interference from those symbols already transmitted.

43. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schnell in view of Chun and Ramberg, and further in view of Kanemoto et al. (US 2003/0012269 A1).

44. Regarding claim 12, Schnell is silent about eliminating already determined symbols at the input of the filter to estimate the symbol currently being received.

45. In the same field of endeavor, however, Kanemoto discloses a detection method wherein the contributions of each user to the received signal are determined from the estimated symbols and that, for a given user *k*, the contributions of other users corresponding to the symbols already estimated are eliminated (abstract, line 3) at the input of the filtering step (abstract, lines 5-7 and figure 3, element 202-1).

46. It would have been obvious to one of ordinary skill of the art at the time of the invention to eliminate the contributions of other users as taught by Kanemoto in the detection method of Schnell because Kanemoto eliminates interference from those symbols already transmitted.

51. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schnell in view of Chun, Ramberg, and Mottier, and further in view of Song et al. ("Subspace Blind Detection of Asynchronous CDMA Signals in Multipath Channels," IEEE 1999, pp. 21-24).

52. Regarding claim 14, Schnell is silent about the dimension of the lattice when the symbols are being transmitted asynchronously.

53. In the same field of endeavor, however, Song discloses a detection method wherein, the symbols of *K* users being transmitted asynchronously and propagating along a plurality of paths, the dimension of the lattice is equal to the number of symbols of the different users which may interfere and are not yet estimated (page 22, column 2, paragraph 2).

54. It would have been obvious at the time of the invention to utilize a lattice of dimension equal to the numbers of symbols which my interfere with

asynchronous transmission as taught by Song in the detection method of Schnell because it avoids the complications of requiring receiver synchronization.

Other Prior Art Cited

60. The prior art made of record and not relied upon is considered pertinent to the applicant's disclosure.

61. Damen et al. ("Sphere decoding of Space-Time Codes," IEEE 2000, p. 362) discloses a lattice sphere packing representation of a multiuser system.

62. Hottinen et al. (US 5,831,984) discloses a CDMA receiver and method wherein the dimension of code vectors equals the number of users K during synchronous transmission, and 2(K-1) for asynchronous transmission.

63. Kohno et al. (Combination of an Adaptive Array Antenna and a Canceller of Interference for Direct-Sequence Spread-Spectrum Multiple-Access System, IEEE 1990, pp. 675-682) discloses a DSSS-CDMA system with interference cancellation.

64. Hendrickson (US 6,263,013 B1) discloses a system in a DSSS-CDMA receiver which recovers the PN sequence used for spreading the signals.

65. Sylvester et al. (US 6,654,365 B1) discloses a maximum-likelihood detector for CDMA.

66. O'Farrell (US 6,181,729 B1) discloses a spread spectrum communication device which aims at reducing multiple access interference.

Contact Information

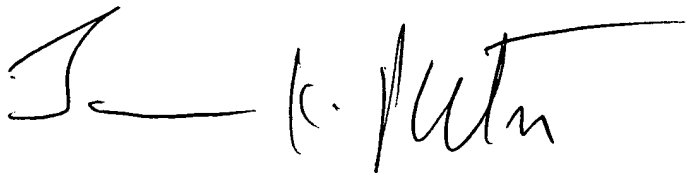
67. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Caroline Angelo whose telephone number is

571-272-8730. The examiner can normally be reached on 8 am - 4:30 pm Monday through Friday.

68. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on 571-272-2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

69. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CJA



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